

STATUS OF THE LATE PLEISTOCENE FOSSIL DARTER *ANHINGA LATICEPS* (DE VIS, 1906)

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Plotus (= *Anhinga*) *laticeps* (De Vis, 1906), described from the late Pleistocene sediments of Coopers Creek, was compared with 31 specimens of the extant *Anhinga melanogaster* novaeollandiae. While *A. laticeps* has a large interorbital width and nasofrontal hinge relative to extant darters, these do not constitute sufficient differences to justify its separation as a species. *Anhinga laticeps* is, therefore, recognised as a junior synonym of *A. m. novaeollandiae*. □ *Anhinga laticeps*, darter, taxonomy, Pleistocene, Anningidae, Aves.

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Charles De Vis described numerous fossil birds between 1885 and 1911 (van Tets & Rich 1990). Some of these were based on a collection made by Professor Gregory of over 200 small bones from the deposits around Lake Eyre (De Vis, 1906). A fossil cranium and partial pelvis from Coopers Creek were described as a darter *Plotus* (= *Anhinga*) *laticeps* (De Vis, 1906). A museum label, in the handwriting of De Vis, also lists a coracoid (No. 70) on the same card as the two former specimens but this bone or bone fragment was not mentioned by De Vis in his original description, nor has it been seen or noted by any subsequent author and so must, therefore, be presumed lost.

De Vis (1906:18), in his description of *P. laticeps*, stated that "... this cranium is in all its dimensions somewhat larger than that of *Anhinga melanogaster*, it prohibits us referring it to the small species previously described *P. parvus*".

Plotus parvus De Vis (1906) has since been shown to be a Little Pied Cormorant *Phalacrocorax melanoleucos* (Miller, 1966). Miller (1966) reviewed the cranium and pelvic fragment described by De Vis and nominated the cranium as the lectotype of *Anhinga laticeps* (as De Vis did not formally specify a type) and referred the pelvic fragment to the extant *Anhinga melanogaster novaeollandiae*. While Miller (1966) considered *A. laticeps* to be a valid species, Brodkorb & Mourer-Chauviré (1982) have since questioned this view. Miller (1966:318) also reviewed a number of Pleistocene darter fossils from central Australian deposits and concluded that "they differ in no aspects of size or shape", assigning all to the extant *A. m. novaeollandiae*.

Recently described a new fossil darter from the early Pliocene Bluff Downs Local Fauna, the only other extinct member from the Anningidae recorded from Australia to date.

A fossil cranium and partial pelvis from Coopers Creek, Lake Eyre (De Vis, 1906). A fossil cranium and partial pelvis from Coopers Creek, Lake Eyre (De Vis, 1906).

Plotus (= *Anhinga*) *laticeps* (De Vis, 1906). A De Vis type material was borrowed from the Queensland Museum. Fossil remains of other darters were in the Australian National Wildlife Collection, CSIRO Division of Wildlife and Ecology, on loan from other institutions. Comparisons were made with 31 specimens of the extant *A. m. novaeollandiae* as well as all fossil material referred to this taxon. Taxonomic position of the Old World darters follows Mayr & Collin (1979) and Marchant & Higgins (1990) in recognising only one species, *Anhinga melanogaster*. Terminology of bones is from van den Driesch (1976). Abbreviations for specimen numbers: AM, Australian Museum; ANWC, Australian National Wildlife Collection, CSIRO Division of Wildlife and Ecology; MV, Museum of Victoria; QM, Queensland Museum; ROM, Royal Ontario Museum; SAM, South Australian Museum; UCMP, University of California Museum Paleontological Collection.

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TABLE 1. Measurement (mm) of cranium. Measurements as defined below: range; mean \pm standard deviation; standard error, coefficient of variation (%); 95% confidence interval of the mean.

Measurement	<i>Anhinga m. novaehollandiae</i> n=31	<i>A. laticeps</i> n=1
CGL	45.6-50.8 47.4 \pm 1.24 .001, 2.6 47.3-47.4	49.6
CGW	20.8-24.7 22.8 \pm 0.78 0.14, 3.4 22.6-23.1	23.0
COW	5.9-7.7 6.7 \pm 0.41 0.07, 6.1 6.7-6.8	8.1
CDW	18.0-21.6 19.7 \pm 0.89 0.20, 4.5 19.3-20.1	19.5
CGW	16.1-19.1 17.60.75 0.13, 4.2 17.3-17.8	17.4
CIW	8.1-10.2 9.3 \pm 0.53 0.10, 5.6 9.1-9.5	10.3

fully grown or mature individuals, based on the absence of the juvenile condition of a "... pitted surface of the bone and incomplete ossification of the articular facets" (Campbell, 1979:17). The measurements taken were as follows:

Cranium greatest length (CGL). Measured as the greatest distance from the *protuberantia occipitalis externa* to the *incisivium*.

Cranium greatest width (CGW). Measured across the *linea nuchales superior*.

Cranium orbital width (COW). Measured as the smallest breadth between of the *pars nasalis* of the *frontale*.

Cranium greatest postfrontal width (CPW). Measured as the greatest breadth across *processus postfrontales*.

Cranium greatest depth (CGD). Measured from the *basitemporale* in the median plane to the highest and median point of the braincase.

Cranium incisivium width (CIW). Measured as the greatest width at the base of the *incisivium*.

COMPARATIVE MATERIAL

Skeletons (catalogue number, sex, locality) of *Anhinga m. novaehollandiae* are as follows:

Anhinga m. novaehollandiae AMO.62367 ? Australia; AMO.65078 ? Magela Floodplain,

Northern Territory; AMO.65077 ? Magela Floodplain, Northern Territory; AMO.65076 ? Magela Floodplain, Northern Territory; AMO.65075 ? Magela Floodplain, Northern Territory; ANWC (PELS 38) ? Papua New Guinea; ANWC (PELS 316) ? Burrinjuck Dam, New South Wales; ANWC (PELS 318) ? New South Wales; ANWC (PELS 319) ? Burrinjuck Dam, New South Wales; ANWC (PELS 320) ? Burrinjuck Dam, New South Wales; ANWC (PELS 356) ? Woolgarlo, Piney Ridge, New South Wales; ANWC (PELS 37) ? New South Wales; MV W4754 ? Victoria; MV W5092 ? Victoria; MV W5913 ? Victoria; MV W8972 ? Victoria; MV W12746 ? Victoria; MV W13183 ? Healesville Sanctuary, Victoria; MV B8674 ? Melbourne Zoo, Victoria; MV B8675 ? Reedy Lakes, Kerang, Victoria; MV B11664 ? Reedy Lakes, Kerang, Victoria; MV B16242 ? Top Marsh, Kerang, Victoria; MV B17254 ? Lake Mokoan, Victoria; MV B17255 ? Lake Mokoan, Victoria; MV B17595 ? Lake Mokoan, Victoria; MV B18970 ? Lake Mokoan, Victoria; QM 21032 ? Queensland; QM 21031 ? Queensland; QM 20798 ? Queensland; ROM 157468 ? Australia; SAM 31686 ? Lashmars Lagoon, Kangaroo Island, South Australia.

RESULTS

All cranial measurements of *A. laticeps*, except the cranium orbital width (COW) and the cranium incisivium width (CIW), fall within the observed range of those for extant darters (Table 1). There is a depression in the region of the *pars nasalis* of the frontal bone which is clearly illustrated in Plate VI of De Vis' original description and marked with a small "a" (De Vis, 1906). It runs from the frontal region commencing behind the *processus postfrontalis* and continues through to the *processus frontalis* of the premaxilla. This appears to have been a post-mortem fracture as there is no sign of any bone regrowth. The depression probably contributes to an artificial widening of the interorbital area through the flexure of the orbital bones on either side to accommodate the depressed bone piece. The large cranium orbital width is, therefore, considered to be artefactual.

The cranium incisivium width of *A. laticeps* is not significant at two degrees of freedom and, therefore, not considered to be of taxonomic importance. The cranium of *A. laticeps* lacks most of the features on the dorsal side and retains just a remnant of the basisphenoid rostrum. De Vis

(1906:18) remarked that the "presphenoid rostrum is higher and much stronger than it is in the recent bird." Comparison with the 31 specimens of the living *A. m. novaehollandiae* has shown this feature to be extremely variable and that *A. laticeps* fits well within that variation. In all other cranial features, *A. laticeps* compares very well with the modern *A. m. novaehollandiae*.

COMPARISON WITH FOSSIL MATERIAL

Several specimens of fossil darters were collected from the vicinity of the type locality and identified as *A. laticeps* by R.H. Tedford and his team in the late 1950s. Some of these were reviewed by Miller (1966) and assigned to *A. m. novaehollandiae*. A single vertebra and bone fragment (UCMP 56351), a proximal end of an ulna (UCMP 56319) and a proximal end of a humerus (UCMP 94681) collected by R.H. Tedford from Coopers Creek, all compare well with extant *A. m. novaehollandiae* in both size and features (humerus greatest width: *A. m. novaehollandiae* 22.8mm - 19.4mm (Mackness, unpublished data); *A. ?laticeps* 20.2mm).

Other *Anhinga* specimens have been collected from the Katipiri Formation of Lake Kununka, eastern Lake Eyre Basin. These were questioned by Vickers-Rich (1991) as being of Pliocene age but are clearly labelled by their collector R.H. Tedford as being from the Katipiri Sands, a Pleistocene deposit. A vertebra (UCMP 112825) is too worn for diagnosis but compares well with the extant *A. m. novaehollandiae* in size as does a cervical vertebra (UCMP 56852). Two proximal ends of humeri (UCMP 60545, greatest width: 18.4mm; UCMP 56885 20.9mm) compare well with extant *A. m. novaehollandiae* in both size and features. A distal end of an ulna (UCMP 60863) from the Pleistocene beds of Warburton River in South Australia is also regarded as inseparable from the extant darter.

DISCUSSION

In his original description of *A. laticeps*, De Vis (1906) compared the fossil with only one specimen of the extant darter *Anhinga m. novaehollandiae*. Miller (1966), in his subsequent revision of Australian darters, used seven specimens of *A. m. novaehollandiae* and two specimens of *A. anhinga*. This study utilised an examination by Mackness (unpublished data) of 56 darter skeletons (12 specimens of *A. anhinga*; 13 of *A. melanogaster rufa* and 31 of the extant

A. m. novaehollandiae) as well as fossil material referred to this taxon. Because of the obvious large size of *A. laticeps*, only *A. m. novaehollandiae*, the largest of the extant darters, was used in the statistical analysis.

Miller (1966:317) supported the retention of *A. laticeps* as a valid species on the basis that "the measurement of *laticeps* exceed the mean of the modern material by more than three times the standard deviations". With a much wider data set, only one of these measurements now falls within this category and that measurement is suspect owing to post-mortem fracturing. Several specimens of extant darter fall outside two degrees of freedom, particularly ANWC (PELS) 316, a large female from Burrinjuck Dam in New South Wales. It is clear that there is significant variation within certain darter measurements and caution should be exercised in making taxonomic decisions before first comparing any specimen with a suitable data set encompassing such variation.

There is not more than one darter species occurring in any one location anywhere in the world within extant populations (Dorst & Mougin, 1979), nor is there any evidence of this in the fossil record (Mackness, in press). With demonstrable specimens of *A. m. novaehollandiae* from the Pleistocene of Australia and a new species of darter from the Pliocene (Mackness, in press), it is unlikely that a second form of darter lived during the Pleistocene. Even if the large interorbital width of *A. laticeps* proves to be not artefactual, the continued recognition of this palaeospecies cannot be justified, and its synonymy with *A. m. novaehollandiae* is the best solution.

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